



Australian Bureau of Statistics

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UPDATE ON RECOMMENDATION 7 FROM THE INDEPENDENT TECHNICAL REVIEW

INTRODUCTION

The Executive Summary of an independent technical review into the Labour Force Survey (LFS) and the ABS response to the review's recommendations were released on the ABS website on 9 December 2014. For details see the November 2014 issue of Labour Force, Australia (cat. no. 6202.0). This note provides an update on recommendation 7 of the review which related to the use of Bayesian techniques in identifying and resolving problems with the LFS.

Recommendation 7 of the review and the ABS response are:

Recommendation 7: Bayesian techniques should be considered as a means of identifying and resolving potential problems in core LFS series.

ABS Response: Agree and is in progress (in relation to assessing the relevance of the techniques) with findings to be reported by June 2015.

While the ABS is investigating Bayesian techniques, the ABS will continue to use the current composite estimator methodology for the Labour Force Survey and considerable additional work is required before the Bayesian techniques can be considered a viable alternative.

THE ADVANTAGES AND DISADVANTAGES OF BAYESIAN TECHNIQUES

Bayesian techniques offer the opportunity to incorporate prior information (including expectations) into the estimation framework. The method combines the new information derived from the survey with prior information that has been established independently of the survey. The method takes account of the level of uncertainty in both the survey results and in pre-existing information to assign a weight on each source of information.

In very simple terms, the advantages of Bayesian techniques are to offer a rigorous and transparent method for combining survey data with prior information to form a final estimate. This approach makes the final estimate more coherent with prior information.

On the other hand, the disadvantages of Bayesian techniques are in the subjectivity in the choice of prior information, and the potentially longer time required to detect a turning point in the series, given that the final estimate no longer comes solely from the survey data.

DEVELOPING A BAYESIAN ESTIMATION METHOD

The Bayesian estimation method specifies prior information in the form of a prior distribution. A

simple approach to specifying a prior distribution is to base it on the past history of the survey estimates. Using the Labour Force Survey as an example, if the past several months have shown consistent growth in the number of people employed, this can lead to an expectation that the growth will continue into the current month. Expectations, and the level of certainty in these expectations, can be further refined by considering other sources of information that may indicate past behaviour is likely to change.

For example, based on existing knowledge of labour markets, it may be expected that employment will increase by 0.2% over the previous month's value. There is some uncertainty in this, and the range of likely outcomes may be expected to vary between a 0.1% fall in employment and a 0.5% increase. This can be specified in terms of a prior distribution with a central value of 0.2% increase in employment and a margin of error of 0.3%.

ASSESSING THE IMPACT OF BAYESIAN TECHNIQUES

The ABS has created some initial test estimates using Bayesian techniques on past survey data. This work compares the estimates that would have been produced using Bayesian techniques with the estimates that were produced using the existing estimation methods. For this initial work expectations were based on the previous history of the labour force series. The trend series estimate for the previous month has been used as the starting point for the expectation of what the current month estimate will be.

For example, the April 2015 trend series estimate of number of persons employed in April 2015 is 11,725,000. To produce a Bayesian estimate for May 2015, the expectation could be that the seasonally adjusted employment estimate will stay at a level of around 11,725,000 persons in May. This provides the central value for the prior distribution. To assess the impact of the Bayesian techniques, a range of values for the variance (or level of uncertainty) of the prior distribution is then considered. When the prior distribution has a large variance it indicates a high level of uncertainty, and survey data are given a high weight for the final estimate. When the prior distribution has a low variance, it indicates a high level of certainty, and less weight is given to the survey data. By controlling the variance of the prior distribution, it is possible to influence how much weight is given to the survey data, and so influence the extent to which prior information has on the final estimate.

This approach allows the impact of different scenarios to be assessed. The work shows that some volatility in the survey-based estimates is smoothed out, but also that, as would be expected when expectations are based solely on past history, the Bayesian estimate lags the survey-based estimate in showing sudden growth or sudden decline in the series.

CONCLUSIONS

The work performed to date has indicated that Bayesian techniques are a feasible approach, and has also emphasised the importance to the final result of appropriate specification of the uncertainty in prior information. An appropriate specification will reduce volatility in the estimates while retaining appropriate sensitivity to changes in labour market conditions.

More work will be done to try to incorporate a range of data sources (for example, surveys or taxation data) to produce more sophisticated estimates that more closely reflect the pre-existing expectations of likely estimate values prior to the release of survey results. Careful attention will be paid to what the different sources of data say about the labour force series, in order to determine an appropriate weighting of the different data sources. The aim will be to reduce the variability in estimates while maintaining a timely identification of turning points.

The basic Bayesian technique can also be extended to a Bayesian multiple regression method. This technique is another method of incorporating other sources of information such as economic indicators through regression models, while also taking advantage of prior information to deliver a final estimate.

The survey data themselves will continue to be a very important source of information when using Bayesian techniques. These data directly measure the labour force characteristics of the survey sample, and are the most current source of data available. With the Labour Force Survey having a good sample design, the survey results will continue to be assigned a high weighting in the production of estimates in any trial of the Bayesian techniques.

The ABS is consulting with academics and stakeholders, including the Labour Statistics Advisory Group, to identify sources of information that can be used for these Bayesian techniques.

The ABS will continue to use the current composite estimator methodology for the Labour Force Survey and considerable additional work is required before the Bayesian techniques can be considered a viable alternative. No changes will be made to the estimation methodology for labour force statistics without consultation, and if any change is proposed it will be notified well in advance of implementation.

A further update on this research will be provided in the November 2015 issue.

FURTHER INFORMATION

For any queries, contact Labour Force Estimates on Canberra 02 6252 6525, or via email on labourforce@abs.gov.au. The ABS Privacy Policy outlines how the ABS will handle any personal information that you provide to us.

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